Fisheries and Oceans Canada | Pêches et Océans Canada
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Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2015/008

Central and Arctic Region

Proceedings of the regional peer review of the pre-COSEWIC assessment of River Darter

December 8, 2014
Winnipeg, Manitoba

Chairperson: Kathleen Martin
Editor: Lia Kruger

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April 2015

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

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ISSN 1701-1280

Correct citation for this publication:

DFO. 2015. Proceedings of the regional peer review of the pre-COSEWIC assessment of River Darter; December 8, 2014. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2015/008.

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SUMMARY

A regional Science peer-review meeting was held on December 8, 2014 in Winnipeg, Manitoba. The purpose of the meeting was to review existing information relevant to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status assessment for River Darter *(Percina shumardi)*. The meeting included participants from Fisheries and Oceans Canada (DFO), the Ontario Ministry of Natural Resources and Forestry, and the University of Toronto.

This Proceedings report summarizes the relevant discussions from the meeting and presents revisions to be made to the working paper. The working paper reviewed at the meeting will be published as a Research Document along with these Proceedings on the Canadian Science Advisory Secretariat (CSAS) website.

Compte rendu de l'examen régional par les pairs de l'examen pré-COSEPAC concernant le dard de rivière

SOMMAIRE

Une réunion régionale d'examen scientifique par les pairs s'est tenue le 8 décembre 2014 à Winnipeg, au Manitoba. Cette réunion a été convoquée afin d'examiner l'information existante permettant au Comité sur la situation des espèces en péril au Canada (COSEPAC) d'évaluer l'état du dard de rivière (*Percina shumardi*). Des participants de Pêches et Océans Canada (MPO), du ministère des Richesses naturelles et des Forêts de l'Ontario et de l'Université de Toronto étaient présents à la réunion.

Le présent compte rendu résume les discussions pertinentes de la réunion et présente les modifications qui doivent être apportées aux documents de travail. Le document de travail examiné lors de la réunion sera publié en tant que document de recherche et le présent compte rendu sera publié sur le site Web du Secrétariat canadien de consultation scientifique (SCCS).

INTRODUCTION

The River Darter (*Percina shumardi*) was included on COSEWIC's fall 2013 Call for Bids to produce a status report. This species was last assessed by COSEWIC in April 1989 at which time it was ranked as Not at Risk, with the following justification:

> "This little-known species is not abundant where it occurs in Manitoba and Ontario, but populations appear to be stable."

To help with COSEWIC's re-assessment of River Darter in Canada, Fisheries and Oceans Canada (DFO) conducted a pre-COSEWIC assessment of the species. The purpose of the meeting, as described in the Terms of Reference (Appendix 1), was to peer-review existing DFO information relevant to the COSEWIC status assessment for River Darter in Canadian waters, consider data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and assess the strengths and limitations of the information. Meeting participants included Fisheries and Oceans Canada (DFO), the Ontario Ministry of Natural Resources and Forestry, and a University of Toronto expert (Appendix 2). The meeting generally followed the agenda outlined in Appendix 3. The meeting participants reviewed the working paper in support of the upcoming reassessment of the species, which incorporated new Canadian data collected since the previous assessment in 1989. The meeting was held at the Freshwater Institute in Winnipeg, Manitoba and by WebEx and teleconference, on December 8,2014.

DISCUSSION

The meeting Chair reviewed the objective of the meeting with the participants. A working paper on the life history characteristics of the River Darter had been developed by DFO and provided to the participants in advance of the meeting. This working paper was the basis for discussions. The participants were encouraged to add data or provide other feedback as needed to ensure that the best, most accurate information was included.

WORKING PAPER PRESENTATIONS

Author: T.C. Pratt, W.M. Gardner, D.A. Watkinson, and L.D. Bouvier

Abstract

The River Darter (*Percina shumardi*) is a native, cryptic fish that has been collected haphazardly in central Canada in relatively small numbers since the 1930s. It has a wide geographic distribution, and in Canada populations of River Darter are found in Manitoba, Ontario and Saskatchewan in three National Freshwater Biogeographic Zones – Saskatchewan-Nelson River, Southern Hudson Bay-James Bay, and Great Lakes-Upper St. Lawrence. As many of the Canadian records of River Darter are quite old, in preparation for the status report Fisheries and Oceans Canada (DFO) revisited many of the historic sites and sampled additional areas where possible to confirm and update the distribution of River Darter in Canadian waters, assess relative abundance, update life history characteristics, diet information, and identify characteristics of River Darter habitat. Over one thousand (1032) River Darters were captured in 29 waterbodies throughout the species' historic range, in relatively high abundance in both the Saskatchewan-Nelson River and Southern Hudson Bay-James Bay biogeographic zones. While still extant in the Great Lakes-Upper St. Lawrence zone, River Darter exist at very low abundance. River Darter in Canadian waters possess similar life history traits and select comparable prey as conspecific populations located in the United States. River Darter reach maturity after their first winter, grow to approximately 40 mm in their first year and slowly

thereafter with growth of 10 mm·y. River Darter in these populations live up to 4 years and eat a wide variety of aquatic prey (e.g., chironomids, caddisflies, mayflies, snails and zooplankton). River Darter is a benthic species found in a wide variety of habitats including lotic and lentic waters at varying depths.

Methods Presentation

Historic sampling

Presenter: W.M. Gardner

An overview of the historical sampling (1930s to 1990s) in Ontario was provided. Historical sampling used seining and backpack electrofishing exclusively to collect River Darters. The 2013 and 2014 sampling used bottom trawling to sample in 2-5 m of water and did not replicate historic sampling techniques. In addition, boat electrofishing was conducted as part of a larger fish community sampling effort on the Rainy River in 2013. Targeted, trawl sampling for River Darter occurred in June and September 2014.

Generally, about 4-10 trawls were undertaken per river system. This was location dependent, not all areas had suitable habitat for trawling. Once one River Darter was captured in a system, the goal was to collect 20 specimens for genetic, life history and diet analysis with a maximum of 30 River Darter captured per system.

A participant asked how efficient the trawls were at collecting River Darter. Trawling is the gear of choice and has been found to be very efficient for collecting River Darter. It is possible that some River Darter might escape but trawls work well on benthic species. Electrofishing is not believed to be very effective for cryptic benthic species and when used River Darter were caught but in low numbers. The current trawling method has been found to be more efficient than electrofishing or seining (which has been used historically) as more ground can be covered. Areas targeted for trawling included gravel, cobble and sand, although cobble was often associated with boulders. There weren't any problems with fines clogging the trawl. Areas were sampled wherever possible and the GPS was used to measure the length of trawl afterwards. Each site was different in length. Time and distance travelled were used to calculate speed during trawling. When new sites were added to historic data, the range did not change much; it expanded east on the Rainy River watershed with the addition of Little Turtle Lake.

On the distribution map, a single point identified a sample from the Ottawa area[1]. Participants asked what was known about that record. It was a Canadian Museum of Nature record. One of the authors was going to check further to see if it was a legitimate occurrence of River Darter or an erroneous record.

Southern Ontario Sampling

Presenter: L.D. Bouvier

In southern Ontario, the three River Darter records were all incidental as sampling did not target River Darter. This year (2014), River Darter was caught as part of a Gravel Chub survey using a trawl. There has been no focused River Darter work in southwestern Ontario. Participants asked if the surveyed rivers had been trawled thoroughly for other species or whether there were areas that were not sampled. Sampling had been done previously in these systems but not by trawling, so the use of a trawl was new. So a lot of the areas that we might expect to find River

[1] Following the meeting, E. Holm at the Royal Ontario Museum indicated this is an inputting error and the species is likely *Etheostoma olmstedi*.

Darter have not been sampled by trawl. Some trawling has occurred and it would be useful to include benthic trawl samples that potentially could have caught River Darter but did not. The group agreed that it would be useful to include a map of sites sampled where trawling occurred but River Darter was not caught as this is important in the COSEWIC assessment. This has been done for other assessment reports using open circles to indicate effort without results. There was a lot of additional information on negative results from trawling in the Thames and Sydenham rivers and connecting channels. Since 2009, 8 km of river spread out over a 40 km stretch of the Thames River has been trawled and River Darter has not been detected. The group agreed that this is important information to include. Additional data may be available for the Sydenham River.

Manitoba Sampling

Presenter: D.A. Watkinson

Historic sampling in Manitoba was discussed. There may be data that are not included on the map in the working paper. There was a drain inventory done in the early 2000s that has River Darter distribution further up in the Swan River area and further south towards Dauphin Lake. Some River Darter were found way up in modified drainages (e.g., Boyne River) that are not good fish habitat now as they have been channelized and modified and regulated with small dams and control structures. Trawling was conducted on the Assiniboine River in 2009 and 70% of trawls caught at least one River Darter. The same area was re-visited in fall 2014 and 40 River Darter were caught in ten trawls. Trawling was conducted further up the Assiniboine River as well. This was not well represented on the map. In the Canadian Shield region, all River Darter were caught in non-targeted sampling mostly by boat electrofishing as very little trawling was conducted. River Darter was caught in the Rainy River by boat electrofishing. Trawling was conducted in fall 2014 at the base of impassable falls on the Manigotagan River but no River Darter were caught. However they were caught near the lake/river confluence shore. River Darter had been captured in past sampling at the falls, but this occurred earlier in the summer. River Darter may be making upstream spawning migrations falling back to the lake following spawning. This suggests that there may be seasonality in their habitat use.

Sampling in Manitoba has not targeted River Darter. The distribution of River Darter in Manitoba and northwestern Ontario seems to be holding and even fairly abundant in some systems with the right habitat.

Historically, seining and backpack electrofishing was mostly conducted in shallow water. More recently, sampling has been done in water over 1 m deep. One fish was caught at 15 m in Lake Winnipeg by a beam trawl. This is included in the COSEWIC report but not the working paper and the group agreed it should be added with the rest of the Manitoba data in the working paper. River Darter seem to be associated with current in rivers and in lakes they are associated with energetic areas influenced by fetch and waves. River Darter are not typically found in deep water and have been caught near the shoreline in lakes. Given the distribution of River Darter, they are generalists to large bodies of water with an energetic component to their habitat (i.e., flowing water or waves). The habitat in the Red River is probably not great, but closer to Lockport it might be a bit better.

The data point in Saskatchewan from 1990 appears to be a real record. They may be in the Saskatchewan River system. There are also data points in northern Manitoba.

Participants agreed that three separate maps should be included in the working paper for Manitoba, northwest Ontario and southwest Ontario.

Abundance

Presenter: T.C. Pratt

An overview of the abundance information that was included in the working paper was provided. There was a question about whether to use designatable units or biogeographic units in the working paper. The meeting chair clarified that the Terms of Reference states that the group is not making any decisions about designatable units, just providing relevant information for COSWEIC to make specific determinations. Biogeographic units will be used in the working paper instead of Designatable Units.

River Darter are fairly wide spread and relatively abundant in many of the areas in Ontario but not so much in the southern Ontario drainage. There was a discussion around the effective sampling width of 2.5 m used in the working paper. The trawl is 8 feet across but doesn't stay fully extended while fishing so the sampling width would more likely be 2 m. A meeting participant has a report with the calibration done and it reports that the width usually varies between 2.1 and 2.7 m and the height can vary by 30 cm with speed. Height doesn't make that much of a difference for benthic fish as long as the net is on the bottom. The key assumption is that there is the same effectiveness in all habitats.

A better understanding of limitations will be added to the working paper, describing that they have been addressed in the sampling.

Biology

Presenter: T.C. Pratt

The presentation moved on to biology. River Darter are difficult to age. They seem to be reaching around 40 mm in size prior to their first winter. More rings are showing up as they get larger, but there isn't much growth as River Darter seem to grow about 10 mm a year after their first year. The lack of young-of-the-year (YOY) in 2014 in the Assiniboine River could be from change in habitat. The river was running very fast in 2014 and the trawling was conducted close to the bank. The sampling did lots of YOY of other species thought. The sex ratio was extremely skewed. Almost 100% of the River Darter caught in the Assiniboine were female as only one male was caught.

Other darters were caught in the sampled areas including Blackside Darter, Johnny Darter and Logperch. This should be included in the working paper. In addition, it is also important to identify where the distribution of fish Species at Risk overlap with River Darter.

Diet

Presenter: T.C. Pratt

Participants asked if zooplankton was showing up in the diet later in the sampling because most of the late summer and early fall samples were composed of age-0 fish while the few were sampled in the June samples. Smaller fish might be eating smaller prey. The June samples have a different diet component than the fall samples. Each population seemed unique in what they are eating. This could be because they are generalists and eat whatever is available in each area.

The Chair asked the group if they were happy with the document the way it was. Meeting participants made the following suggestions; it would be helpful to have a map showing the biogeographic regions (using the ones from the COSEWIC website), as well as including a map with named locations on it (i.e., rivers and lakes named in the report), and change 'location' to 'site' following the COSEWIC vernacular to avoid confusion. COSEWIC uses 'location' as a

concept which links population with the spatial foot print of a threat that could cause a large demographic change, not a place where a species is captured or where a population is found.

Editorial comments will be sent to the authors. One participant wondered if there were any current references to suggest that River Darter are still abundant. One of the authors will check out the newer state books (Fishes of Arkansas, Fishes of Kansas, and Fishes of Alabama) and inquire about Nebraska and Missouri.

After the break, one of the authors presented a map of their sampling efforts. They haven't caught any River Darter from Lake Winnipeg. There was a discussion around how the maps should be presented in the working paper. One suggestion was to exclude the surveys which were not using a trawl on the sampling effort map. Although it was cautioned that seining may still capture River Darter. Another suggestion was to try a few different options with the maps and see which offers the most clarity.

Genetics

Presenter: Scott Reid and Anne Kidd

Overview of presentation

Based on evidence of discreteness and evolutionary significance, groups of populations can be assessed by COSEWIC as separate Designatable Units (DUs). For freshwater fishes, the delineation of DUs has been informed using COSEWIC's National Freshwater Biogeographic Zones and population genetic structure. A map of the biogeographic zones where River Darter are found was presented. More than 200 tissue samples were obtained from DFO and the Royal Ontario Museum. Samples included 16 populations distributed across over three biogeographic zones: Saskatchewan – Nelson River, Southern Hudson Bay – James Bay, and Great Lakes – Upper St. Lawrence. Individuals were sequenced at two mitochondrial DNA (mtDNA) regions: CO1 (525 base pairs) and cytochrome-b (926 base pairs). CO1 is less useful for population structure, but useful for confirmation of species identification. Species identification was confirmed for all specimens (n = 230) sequenced. Twenty-four CO1 haplotypes were identified, although 93% of individuals shared a single haplotype.

Cytochrome-b can provide valuable information on population structure over large geographical area for darter species. Twenty-six cytochrome-b haplotypes were identified from 143 individuals sequenced. Forty-five percent of individuals shared a single haplotype present across all three zones. Two of the three individuals from the Great Lakes – Upper St. Lawrence zone shared a unique haplotype. Six haplotypes were unique to the Saskatchewan – Nelson River zone. Two unique haplotypes were found in one of the two Southern Hudson Bay – James Bay populations (Batysdawa Lake). The other population, Lake St. Joseph, is affected by a water diversion into the Winnipeg River drainage and the common haplotype present may reflect a connection to Saskatchewan – Nelson River populations. There is evidence of partitioning of haplotypes diversity across at least two of the biogeographic zones (Saskatchewan – Nelson River and Great Lakes – Upper St. Lawrence). Sequencing of more individuals/locations from the Great Lakes – Upper St. Lawrence and Southern Hudson Bay – James Bay zones would improve results.

There was a discussion around how this information can be used in the COSEWIC report. The presenter offered to provide an unpublished report for the authors to use since the primary publication will not be available in time for the COSEWIC report. The information could be cited as a personal communication or the meeting proceedings could be cited in the COSEWIC status report. The authors will also look into Lake St. Joseph diversion impacts. The genetic information in the COSEWIC report will be much briefer than that in the Cyt-b table in the presentation.

TERMS OF REFERENCE

The meeting Chair reviewed the Terms of Reference with the group. The group went through each section and discussed if the information was included in the working paper.

1) In the life history characteristics section, growth was discussed in the working paper to some extent; mortality and fecundity were not included. One participant added that they have not come across any fecundity data. There were eggs in River Darter from Rainy River last year but they were June samples and likely too late to provide fecundity data. Generation time information was included. The meeting participants thought they could find some information on early life history habitat use to include in the working paper. Lastly, data from Rainy River and Assiniboine River could be included to discuss specialized niche or habitat use.

2) For reviewing the designatable units, the genetic and abundance information will be useful.

3) For the COSEWIC criteria, information on densities and locations will be useful.

Transboundary: There is no barrier at the Red River border which may be relevant. Samples from the Rainy River came from both sides of the border.

4) Habitat and Threats

Threats haven't been discussed in the working paper. Information is available elsewhere so it is not necessary to include it in the working paper; only referencing the documents is needed. It is worth recognizing where the data are limited so it can be identified if an RPA is required in the future.

Recommended research includes more genetic samples from southwest Ontario. There is a gap in the distribution work and sampling needs to be done in the James Bay and Hudson Bay drainage, and the northern end of the distribution needs more work as well. Fecundity work would be helpful for RPA modelling. More samples for genetic analyusis from the Attawapiskat–Lake Joseph area would be helpful. Also, samples from Severn to help separate the biogeographic units (might only be fly in access, no road access) would be useful. Participants suggested catch curve analysis for the mortality rate for River Darter. The sample size may not be large enough.

A question was raised about how old the data is for the historical collection sites in Figure 1 of the working paper. The data is about 15 years old (maybe less). This data will be used for extent and occurrence, and index of area of occupancy calculations and will impact the calculations. So, if the records would have been only 10 years old then these would have a large impact on the extent of occurrence (EO) and Index of area of occupancy (IAO). If there was opportunity for more sampling, this area should be sampled again.

5) Residence: The group agreed the River Darter does have a residence.

6) Threats: A lot of this information could come from co-occurring Species at Risk species.

7) Other: If COSEWIC accepts the designatable units' structure then there is a good likelihood that the Great Lakes-St Lawrence unit will be ranked endangered or threatened and would therefore require a Recovery Potential Assessment (RPA). More samples from southwest Ontario for genetic analysis would strengthen the argument.

Final comments: For the EO and IAO calculations in the COSEWIC report, it would be good to have the individual samples points from 2013 and 2014. That data will be sent to the COSEWIC

authors. Sampled sites at which River Darter were not caught will be mapped and the meaning will be captured in the text of the working paper.

A summary of the genetic information will be send to a meeting participant review.

The Chair thanked participants for their input into the review and then adjourned the meeting.

REFERENCE CITED

Pratt, T.C., Gardner, W.M., Watkinson, D.A., Bouvier, L.D. 2015. An update of River Darter (*Percina shumardi*) distribution, relative abundance, life history traits, diet and habitat in Canadian waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/011. v + 21 p.

APPENDIX 1. TERMS OF REFERENCE

PRE-COSEWIC ASSESSMENT FOR RIVER DARTER

Regional Peer Review Meeting – Central and Arctic Region

December 8, 2014
Winnipeg, Manitoba (Teleconference and WebEx)

Chairperson: Kathleen Martin

Context

The implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments, which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA).

Fisheries and Oceans Canada (DFO), as a generator and archivist of information on marine species and some freshwater species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

The River Darter *(Percina shumardi)* was listed on COSEWIC's Fall 2013 Call for Bids to produce a status report, with the following justification:

> This species was last assessed in April 1989 at which time it was ranked as Not at Risk. The reason for this designation was: "This little-known species is not abundant where it occurs in Manitoba and Ontario, but populations appear to be stable."

Objectives

The overall objective of this meeting is to peer-review DFO existing information relevant to the COSEWIC status assessment for River Darter in Canadian waters, considering data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be available to COSEWIC, the authors of the species status report, and the co-chairs of the applicable COSEWIC Species Specialist Subcommittee. Publications from the peer-review meeting (see below) will be posted on the CSAS website.

Specifically, DFO information relevant to the following will be reviewed to the extent possible:

1) Life history characteristics

- Growth parameters: age and/or length at maturity, maximum age and/or length
- Total and natural mortality rates and recruitment rates (if data are available)
- Fecundity
- Generation time
- Early life history patterns
- Specialised niche or habitat requirements

2) Review of designatable units

Available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation, will be reviewed. Information on morphology, meristics, genetics and distribution will be considered and discussed.

See COSEWIC 2008 "Guidelines for recognizing Designatable Units below the Species Level"

3) Review the COSEWIC criteria for the species in Canada as a whole, and for each designatable units identified (if any)

COSEWIC Criterion – Declining Total Population

a. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of parents). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.

b. Identify threats to abundance— where declines have occurred over the past three generations, summarize the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity.

c. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

COSEWIC Criterion – Small Distribution and Decline or Fluctuation: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Summarise the current extent of occurrence (in km2) in Canadian waters

b. Summarise the current area of occupancy (in km2) in Canadian waters

c. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.

d. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.

e. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

COSEWIC Criterion – Small Total Population Size and Decline and Very Small and Restricted: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Tabulate the best scientific estimates of the number of mature individuals;

b. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarise the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

4) Describe the characteristics or elements of the species habitat to the extent possible, and threats to that habitat

Habitat is defined as "in respect of aquatic species, spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced".

The phrasing of the following guidelines would be adapted to each specific species and some could be dropped on a case-by-case basis if considered *biologically* irrelevant. However, these questions should be posed even in cases when relatively little information is expected to be available, to ensure that every effort is made to consolidate whatever knowledge and information does exist on an aquatic species' habitat requirements, and made available to COSEWIC.

a. Describe the functional properties that a species' aquatic habitat must have to allow successful completion of all life history stages.

   In the best cases, the functional properties will include both features of the habitat occupied by the species and the mechanisms by which those habitat features play a role in the survivorship or fecundity of the species. However, in many cases the functional properties cannot be described beyond reporting patterns of distribution observed (or expected) in data sources, and general types of habitat feature known to be present in the area(s) of occurrence and suspected to have functional properties. Information will rarely be equally available for all life history stages of an aquatic species, and even distributional information may be missing for some stages. Science advice needs to be carefully worded in this regard to clearly communicate uncertainties and knowledge gaps.

b. Provide information on the spatial extent of the areas that are likely to have functional properties.

   Where geo-referenced data on habitat features are readily available, these data could be used to map and roughly quantify the locations and extent of the species' habitat. Generally however, it should be sufficient to provide narrative information on what is known of the extent of occurrence of the types of habitats identified. Many information sources, including Aboriginal Traditional Knowledge (ATK) and experiential knowledge, may contribute to these efforts.

c. Identify the activities most likely to threaten the functional properties, and provide information on the extent and consequences of those activities.

   COSEWIC's operational guidelines require consideration of both the imminence of each identified threat, and the strength of evidence that the threat actually does cause harm to the species or its habitat. The information and advice from the Pre-COSEWIC review should provide whatever information is available on both of those points. In addition, the information and advice should include at least a narrative discussion of the magnitude of impact caused by each identified threat when it does occur.

d. Recommend research or analysis activities that are necessary.
   Usually the work on the other Guidelines will identify many knowledge gaps. Recommendations made and enacted at this stage in the overall process could result in much more information being available should a Recovery Potential Assessment be required for the species.

5) Describe to the extent possible whether the species has a residence as defined by SARA

SARA s. 2(1) defines Residence as "a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating."

6) Threats

A threat is any activity or process (both natural and anthropogenic) that has caused, is causing, or may cause harm, death, or behavioural changes to a species at risk or the destruction, degradation, and/or impairment of its habitat to the extent that population-level effects occur. Guidance is provided in: Environment Canada, 2007. Draft Guidelines on Identifying and Mitigating Threats to Species at Risk. *Species at Risk Act* Implementation Guidance.

List and describe threats to the species considering:

- Threats need to pose serious or irreversible damage to the species. It is important to determine the magnitude (severity), extent (spatial), frequency (temporal) and causal certainty of each threat.
- Naturally limiting factors, such as aging, disease and/or predation that limit the distribution and/or abundance of a species are not normally considered threats unless they are altered by human activity or may pose a threat to a critically small or isolated population.
- Distinction should be made between general threats (e.g. agriculture) and specific threats (e.g. siltation from tile drains), which are caused by general activities.
- The causal certainty of each threat must be assessed and explicitly stated as threats identified may be based on hypothesis testing (lab or field), observation, expert opinion or speculation.

7) Other

Finally, as time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

Working Paper

A working paper related to the status of the River Darter may be submitted for review 2 weeks prior to the meeting.

Expected Publications

- Proceedings
- Research Document

Participation

Participation is expected from:

- DFO Science
- COSEWIC status report authors

Participation may also include:

- Other invited external experts as deemed necessary

APPENDIX 2. PARTICIPANT LIST

Name		Affiliation
Jason	Barnucz	Fisheries and Oceans Canada, Science
Lynn	Bouvier	Fisheries and Oceans Canada, Science
William	Gardner	Fisheries and Oceans Canada, Science
Nick	Mandrak	University of Toronto
Kathleen	Martin	Fisheries and Oceans Canada, Science
Tom	Pratt	Fisheries and Oceans Canada, Science
Scott	Reid	Ontario Ministry of Natural Resources
Chantelle	Sawatzky	Fisheries and Oceans Canada, Science

APPENDIX 3. AGENDA

9 a.m. – 4 p.m.	Presenter
Welcome and Introductions	Kathleen Martin
Purpose of Meeting and Terms of Reference	Kathleen Martin
Working Paper Presentation	Tom Pratt, Doug Watkinson, Lynn Bouvier
Discussion	Group
Genetics Presentation	Scott Reid
Discussion	Group
Review Terms of Reference	Kathleen Martin